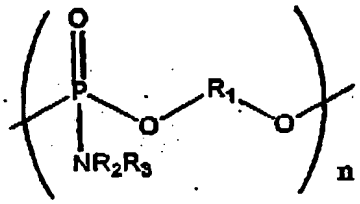
What is claimed is:

1. A water soluble and positively charged biodegradable polyphosphoramidate that is capable of forming a complex with negatively charged bioactive macromolecules in aqueous solutions and comprises the recurring monomeric unit shown in Formula I,



FORMULA I

wherein

R_1 is a divalent aliphatic organic moiety;

R_2 and R_3 are each independently selected from the group consisting of hydrogen, alkyl, or heteroalicyclic groups;

each non-hydrogen occurrence of R_2 and R_3 is substituted with one or more positively charged groups; and

n is from 20 to 2,000.

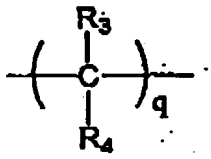
2. A positively charged biodegradable polyphosphoramidate of claim 1, wherein the biodegradable polyphosphoramidate has between about 20 and about 2,000 phosphoramidate groups.

3. A positively charged biodegradable polyphosphoramidate of claim 1, wherein non-hydrogen occurrences R_2 and R_3 are substituted with one or more charged groups selected from the group consisting of primary amine, secondary amine, tertiary amine, quaternary amine or imidazoyl.

4. A positively charged biodegradable polyphosphoramidate of claim 1, wherein one or more of R_1, R_2 or R_3 is substituted with one or more groups capable of facilitating intracellular delivery of a negatively charged bioactive macromolecules, selected from the group consisting of lysosomalytic agent, an amphiphilic peptide, or a steroid derivative.

5. A positively charged biodegradable polyphosphoramidate of claim 4, wherein the group capable of facilitating intracellular delivery of negatively charged bioactive macromolecules is a cholesteryl group.

6. A positively charged biodegradable polyphosphoramidate of claim 1, wherein R_1 is defined in Formula II,



FORMULA II

wherein

each occurrence of R_3 and R_4 are independently selected from the group consisting of hydrogen or alkyl group; and

q is 2 to 4.

7. A positively charged biodegradable polyphosphoramidate composition formed by complexation in aqueous solutions comprising:

(a) at least one negatively charged bioactive macromolecule; and

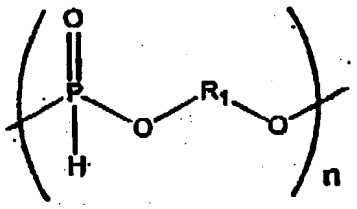
(b) a water soluble and positively charged biodegradable polyphosphoramidate of claim 1.

8. A positively charged biodegradable polyphosphoramidate composition of claim 7, wherein the negatively charged bioactive macromolecules are selected from the group consisting of DNA, RNA, proteins, and polysaccharides.

9. A positively charged biodegradable polyphosphoramidate composition of any one of claims 7 and 8, wherein the biodegradable polyphosphoramidate is capable of complexing 20-60% by weight of the negatively charged biomacromolecules.

10. A method of preparing a water soluble and positively chargeable biodegradable polyphosphoramidate of Formula I, comprising the steps of:

(a). reacting a precursor polymer with recurring unit shown in Formula III,



FORMULA III

wherein

R_1 is a divalent aliphatic organic moiety;

with a primary or secondary amine having a structure of HNR_2R_3, wherein each occurrence of R_2 and R_3 are selected from the group consisting of hydrogen or positively charged alkyl or heteroalicyclic containing protected primary amine, protected secondary amine, tertiary amine, and quaternary amine; followed by

(b). deprotecting the protected amino groups, if applicable.

11. A method of preparing a positively charged biodegradable polyphosphoramidate of claim 10, wherein the biodegradable polyphosphoramidate has between about 20 and about 200 phosphoramidate groups.

12. A method of preparing a positively charged biodegradable polyphosphoramidate composition of claim 7, comprising the steps of:

mixing an aqueous solution of the positively charged biodegradable polymer of Formula I with concentrations ranging from 1 μg/ml to 500 μg/ml,

with an aqueous solution of one or more biological active macromolecules, which is able to complex with polymer of Formula I.

13. A method of preparing a positively charged biodegradable polyphosphoramidate composition of claim 12, wherein the negatively charged or bioactive macromolecules are selected from the group consisting of DNA, RNA, proteins, and polysaccharides.

14. A method of preparing a positively charged biodegradable polyphosphoramidate composition of claim 12 or 13, wherein the biodegradable

polyphosphoramidate is capable of complexing 20-60% by weight of the negatively charged bioactive macromolecules.

15. A method of preparing a positively charged biodegradable polyphosphoramidate composition of claim 12 or 13, wherein the biodegradable polyphosphoramidate has between about 20 and about 200 phosphoramidate groups.

16. A method for the controlled release of a bioactive macromolecule comprising the steps of:

providing a positively charged biodegradable polyphosphoramidate composition of claim 7, and

contacting the composition in vivo or in vitro with a biological fluid, cell or tissue under conditions conducive to the delivery of at least a portion of the biologically active substance to the biological fluid, cell or tissue so that the biologically active substance is released in a controlled manner.

17. A method of claim 16, wherein the bioactive macromolecule is released in-vivo.

18. A method of claim 16, wherein the bioactive macromolecule is released in-vitro.

19. A method of claim 16, wherein the bioactive macromolecule is released extracellularly.

20. A method of claim 16, wherein the bioactive macromolecule is released intracellularly.

21. A method of claim 16, wherein the bioactive macromolecule(s) are selected from the group consisting of DNA, RNA, proteins, and polysaccharides.

22. A method of claim 16, wherein the biodegradable polymer is capable of complexing 20-60% by weight of the negatively charged bioactive macromolecule.

23. A method of claim 16, wherein the biodegradable polymer has between about 20 and about 200 phosphate groups.

24. A method of claim 16, wherein the bioactive macromolecule is a growth factor.

25. A method of claim 16, wherein the bioactive macromolecule is selected from the group consisting of DNA sequences, genes, gene fragments, DNA encoding vaccines, therapeutic agents, cytokines, immunoadjuvants, cancer therapeutic agents, proteins, and combinations thereof.

26. A method of claim 25, wherein the DNA sequence, gene or gene fragment is administered in connection with gene therapy.

27. A method of any one of claims 17 through 26 wherein the positively charged biodegradable polyphosphoramidate composition, including complexes or nanoparticles is delivered in vivo.